SCIENCE.

FRIDAY, APRIL 22, 1887.

COMMENT AND CRITICISM.

THE AMERICAN ASSOCIATION for the advancement of science has decided to hold its thirty-sixth meeting in New York City during the week beginning Aug. 10, 1887. It therefore becomes the duty and privilege of the scientific and educational institutions of the city and vicinity to provide for the meeting in a manner which shall be creditable alike to themselves and to the metropolis. The Academy of sciences, having been asked to take the initiative in the matter, has appointed a committee of conference to secure concert of action among the several institutions. A meeting will be held at the Hotel Brunswick, at 8 o'clock, on the evening of Friday, April 29. The special work before this conference will be the consideration of ways and means, and the formation of permanent committees, which, united, shall constitute a local committee for the meeting of the association. This great national gathering of scientists will be an important event in the history of our city, and should mark an epoch in the development of scientific interest in the community. It is highly desirable, therefore, that the association should find a cordial welcome, and should receive a kind and degree of interest and hospitality worthy of the great metropolis.

THE CENTENNIAL ANNIVERSARY which Columbia celebrated last week, following so closely Harvard's two hundred and fiftieth birthday, is significant of the fact that our larger institutions of learning are growing old. They are evidences of the wisdom of their founders, who, amid all the turmoil and care of opening up a new country to civilization and of developing fitting forms of government, found time to lay the foundations for what have since become the leading colleges and universities of the country. Columbia's centennial was more or less fictitious, since the original charter to King's college bore the date 1754; and the annual commencement in June next is the one hundred and thirty-third. The celebration was really, as the official bulletin announced, of the hundredth anniversary of the "revival and confirmation of the original charter by the legislature of the state of New York." There is much in Columbia's history and in its personal associations to make it peculiarly the college of the city of New York. As Mr. Coudert pointed out in his admirable oration, Columbia has grown with the city's growth, and flourished with the city's prosperity. The prominent men of New York, from Alexander Hamilton and John Jay and DeWitt Clinton to Hewitt and Dix and Agnew and Woodford, are numbered among its alumni. Its influence, though ultra-conservative, has been, on the whole, for good. Under the enlightened presidency of Dr. Barnard, the policy of the college has become more liberal and aggressive, and to-day it is doing far more for the community than it has ever done before.

Having come so far and done so much, the question is naturally raised as to its future development. The public press is urging that the college, with its associated schools of applied science, of medicine, of law, and of political science, should organize itself into a genuine university, and offer those opportunities for advanced instruction and research which its faculties and its situation are so well fitted to provide. The very obvious answer to this is that such a scheme requires large amounts of money; and Columbia has in the past been the recipient of almost nothing, while Harvard, Cornell, and Princeton have had gifts in abundance showered upon them. Columbia is struggling under a heavy debt, and, until that is removed, entrance upon a university career is impossible. Furthermore, its equipment is far from complete. It needs a physical and a biological laboratory, a department of comparative philology, additional provision for historical science, an enlargement of the ludicrously small philosophical department, and, more than all, a library fund which will provide for the book purchases that ought to be made. All these are things not known, perhaps, to those who are clamoring for a university, that serve as an effectual barrier to university development. They are details well known to Columbia's management and alumni, but only made public by the discussions consequent upon the recent

centennial celebration. The friends of the college are in hopes, that, now that these obstacles to rapid development are made known, they may be speedily removed.

A MOVEMENT HAS BEEN STARTED to found a laboratory on the New England coast, where students, teachers, and investigators may find facilities for the pursuit of biology. It is now some years since the brief episode of the Penikese laboratory, which was founded by Mr. Anderson and intrusted to Professor Agassiz. During the interval, summer schools of science have multiplied, and a few of them have successfully maintained their modest usefulness. Of these, one of the most prosperous as well as most needed was the seaside laboratory established at Annisquam, near Cape Ann, six years ago, by the Woman's education association, with the co-operation of the Boston society of natural history. It has given instruction to no less than 102 students, men and women from many states, who were for the most part teachers. The instruction has been almost wholly gratuitous, and the equipment of the laboratory meagre; but the opportunities offered have been sought and prized. As the association does not give permanent support to any of its enterprises, and as its committee in charge of the laboratory was convinced of its utility, they sent a circular letter to teachers of science in different parts of the country, giving an account of the work done, and asking for opinions as to the need of such an institution. The letters received were full and explicit, showing a deep interest in the project of founding a seaside laboratory of broader scope. The committee then called a meeting, at which there was a large attendance of naturalists, the majority being officers of New England colleges. At this meeting the discussion showed a unanimous approval of the work begun at Annisquam and an emphatic resolution to extend and perfect it. To execute this resolution, a committee was appointed with full powers to establish a laboratory on an improved and permanent foundation. This committee, which consists of Prof. Alpheus Hyatt, (chairman), Prof. S. F. Clarke, Mr. John Cummings, Dr. W. G. Farlow, Prof. E. L. Mark, Miss S. Minns, Dr. C. S. Minot, Prof. W. T. Sedgwick, Mrs. C. C. Smith, Mr. B. H. Van Vleck, Mr. Samuel Wells, and Miss A. D. Phillips (secretary), is endeavoring to raise fifteen thousand dollars, half the sum to be used for the land, building, and equipment, the other half to be applied as a guaranty fund for the expenses during five years. It is to be hoped that all those will respond liberally to this appeal, who are interested in improving the methods of education and in contributing to the advancement of science. Subscriptions may be sent to any member of the committee, or to the treasurer, Mr. Samuel Wells, 31 Pemberton Square, Boston, Mass.

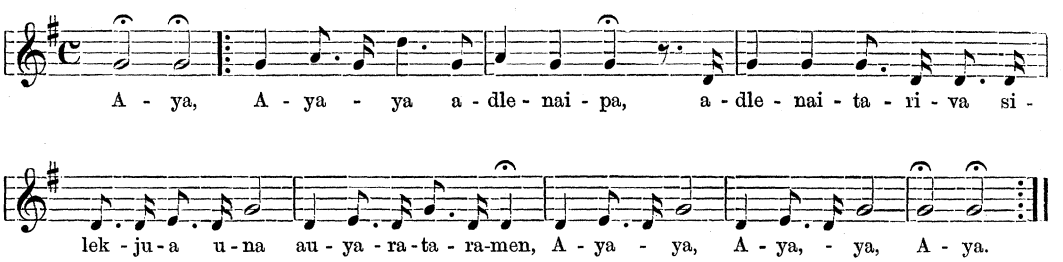
The advantages of the prospective laboratory are manifold. The demand for natural-history teaching has rapidly increased in America. Colleges and schools are seeking teachers competent to give instruction in botany and zoölogy; but teachers have difficulty in fitting themselves in these sciences, because they lack opportunity to obtain suitable training. An additional obstacle to the thorough and practical study is, that many of the most important types of plants and animals are exclusively marine, having no inland representatives. It is impossible to give good biological instruction without immediate familiarity with the principal types of living organisms. The new laboratory is intended to offer practical training in biology with special reference to marine forms. It is hoped that its work in this field will render it a valuable factor in education. The laboratory will also supply collections and materials for class-work to schools and colleges. Advanced workers and specialists will have facilities such as have not existed in this country hitherto, although they have been available in the different biological laboratories sustained by Germany, France, Austria, Italy, England, Scotland, Holland, Sweden, and Russia. The inestimable benefits which have ensued from the discoveries of biologists, and the profound influence of their science upon modern thought, fully justify the attempt to found a laboratory for biological investigation. The experience of the marine stations in Europe, of the summer school at Annisquam, Mass., referred to above, and of the more southern laboratory of the Johns Hopkins university, have established beyond dispute the great value to education and to science of such institutions. The proposed plan of the laboratory, which will be opened this summer if the necessary means are obtained, may be briefly described so far as settled. The management will be intrusted to the following board of trustees: Prof. W. G. Farlow, Miss Florence M. Cushing, Prof. Alpheus Hyatt, Dr. Charles S. Minot, Miss Susanna Minns, Prof. William T. Sedgwick, Samuel Wells, Esq. It is

intended to secure a location at a point on the New England coast where the fauna and flora are abundant and varied, and the cost of living moderate; to build a laboratory with two stories, the lower story having accommodations for teaching twenty-five persons, the upper story having work-places for investigators; to furnish aquaria, microscopes, microtomes, glassware, etc., and a constant supply of water for aquaria; also to have a convenient landing, boats, collecting-apparatus, etc. Of course, to insure the permanency and full usefulness of the laboratory, a considerable endowment fund must be ultimately obtained, but so much can perhaps not be hoped at the start.

PASTEUR, who is now sixty-four years old, was last winter sent by his physician to Italy for his health, and is only just returning to Paris. Under date of April 1, in a letter to his friend Mr. Jules Marcou of Cambridge, which the latter kindly permits us to use, he writes from Arbois in the Jura that he hopes to live to welcome the earliest publications of the Institut Pasteur, and adds, "We have just purchased eleven thousand square meters of land, and the subscription has reached the sum of nearly two million francs; it is, however, very insufficient, for, if we spend twelve hundred thousand on land and buildings, the income from the remainder will be much too small. Oh! if only some American millionnaire were inspired with an enthusiasm for this work! I hope that when we are incorporated, and this will be soon, we shall be better endowed. We shall then be able to receive legacies. To proceed suitably and with full independence, we should have, according to my estimates, three and a half million francs. I am confident. The future is ours. The prophylactic treatment of rabies continues to do well. Very, very rarely are there failures, and all in cases where exceptional circumstances appear. There has been but one failure since the first of January and more than five or six hundred cases treated, a multitude having been most severely bitten. If we could only attack diphtheria, phthisis, etc., with success. We are going to attempt it. It is at least a step toward discovery to have confidence, and to hope in the result of obstinate labor."

POETRY AND MUSIC OF SOME NORTH AMERICAN TRIBES.

ETHNOLOGISTS are well acquainted with the fact that there is no people and no tribe that has not some kind of poetry and music, but the study of this branch of aboriginal literature has hardly been begun. We will give here a few examples of aboriginal poetry which will show that the mind of the native enjoys as well the beauties of nature as we do; that he expresses his grief in mournful songs, and appreciates humorous conceptions. No people is more fond of music than the Eskimos, the inhabitants of the extreme north. Though most explorers affirm that their music is nothing but a monotonous humming, the following tunes and texts, which were collected by me in Baffin Land, will show that this is not true. Here is a song describing the beauties of summer:—



Only the first line is given in the Eskimo language. The translation is, —

"Aya!
Ayaya, it is beautiful, beautiful it is out-doors when the summer comes at last.
Ayaya, ayaya, aya!

Ayaya, it is beautiful, beautiful it is out-doors when the reindeer begin to come,
Ayay a, ayaya, aya!

Ayaya, when the roaring river rushes from the hills in summer.
Ayaya, ayaya, aya!

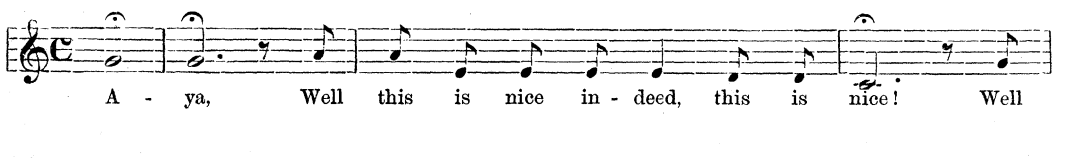
Ayaya, there is no reason for me to be mournful when the gulls cease crying.
Ayaya, ayaya, aya!

Ayaya, plenty of meat I shall have and plenty codfish.
Ayaya, ayaya, aya!

Ayaya, it is beautiful, beautiful it is out-doors when the summer comes at last.
Ayaya, ayaya, aya!"

It was in the midst of winter that I heard this song for the first time. After a long and lonesome journey over the ragged highlands which form the west coast of Davis Strait, almost exhausted by want of food and the exertions of driving and hauling the heavy sledge over rocks and steep snow-banks, we had arrived on the coast of Davis Strait, and struck a track that led to the Eskimo village. No white man had ever visited this part of the coast, and, the men being out hunting, the women and children, who had frequently heard of the *Kadlunait* ('the whites'), rushed out of the huts when they saw the sledge coming with an unknown dog-team and an unknown driver. When they discovered him to be a white man, their excitement reached the highest pitch, and they burst out in a wild dance and chorus, singing the joyful song of summer. This song was the most popular one at the time. It was composed by an Eskimo living farther north, 'Snowwind' (*Kenningnang*) by name, and had spread rapidly over all the settlements.

This man belonged to a family of poets. His nephew, Utityak, had composed a well-known satirical song. One fall, when hunting on the ice, a strong gale set in, and the ice broke up, separating the unfortunate youth from the land and from his companions. Several days he drifted on the floe at the mercy of the winds. Heavy snow-falls covered the drifting ice, the swell broke up the floe, and death stared at him continually. Yet he did not despair, nor even lose his temper, but, in mockery of his own misfortune, he composed the following song: —



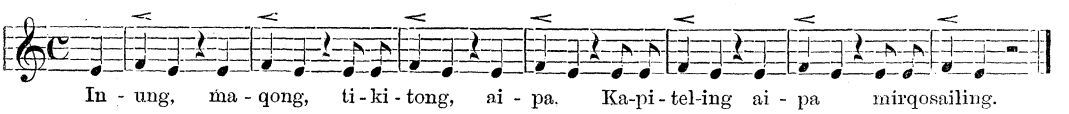
"Aya!
It's glorious on the ice!
Here it's nice!
Behold my lonesome path,
All snow and slush and ice!
This is nice!

"Aya!
It's glorious on the ice!
Here it's nice!
Behold my native land!
It's snow and slush and ice!
This is nice!

"Aya!
Awaking from my slumbers in the dawn,
Monotonous fields of ice
And gloomy lanes of water
I behold.

"Aya!
Oh, when I reach the land
It will be nice.
When will this roaming end?
When will I be at home?
Then it's nice!"

Besides these modern songs, the Eskimos have many ancient ones, some of which are incantations, while others form part of the old traditions. Most of these are mere recitativos, as the song of the boy who was stolen by the sea-monster Kalopaling. He was playing on the ice near a crack, and when he saw a man and a woman who intended to recover him, he sang, —



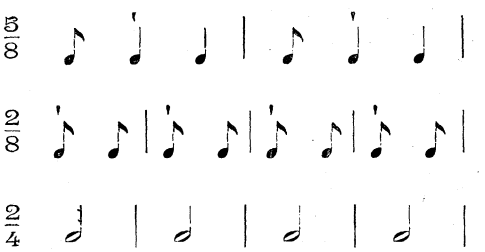
i.e., 'Two men are coming, one with a jacket, the other with a bird-skin dress;' upon which Kalopaling came and took him to the bottom of the sea. Some other songs are lullabies, or sung while playing ball.

During the festivals, singing is one of the principal amusements. Duels in singing are fought, each man trying to outdo the other. Then the singer strips off his jacket, takes the hand-drum, the edge of which he beats with his wrist or a small drum-stick, and, swinging his body according to the rhythm, sings the song he has composed for the purpose, or mocks his opponents by praising his own exploits and skill, and making fun of their awkwardness and laziness. Then the women, who sit nearest the wall of the snow-hut, join the chorus, 'Aya, aya,' while the men sit silent, and, as their turn comes, take the stand.

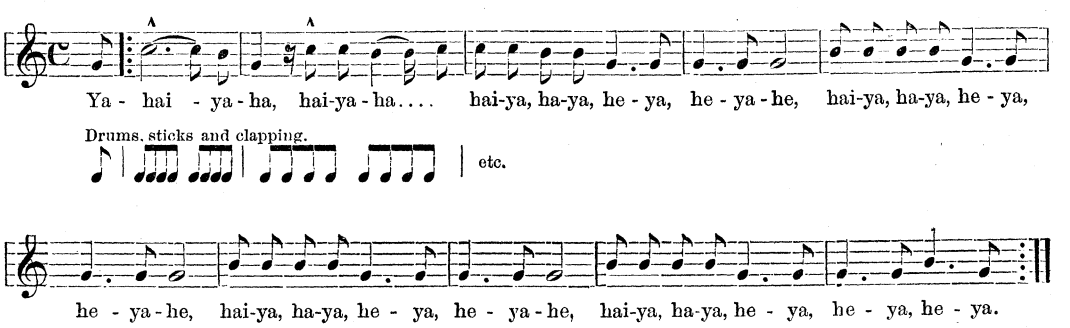
The Eskimos have two different types of tunes, the one corresponding to our major, the other to our minor key. In the first group the fourth is wanting, the scale being in reality identical with the wide-spread one : c, d, e, g, a. The minor key has the following notes : B, c, d, e flat, f, g.

We will give a few tunes from another country, belonging to a people of widely different ethnological character. The author collected them among different tribes of Indians of British Columbia. While the Eskimo prefers the solo chant, these Indians either sing the whole song in chorus, or have some kind of responsorium, the first singer singing the whole text, while the rest join in a refrain or in the second half of the verse. As the rhythm is very complicated, and keeping time is one of the principal demands of the Indian chorus, a singing-master, who instructs the men, is found in every village. In the fall, before the time of festivals begins, he gathers the men about him every day, and walks up and down the street of the village, teaching them to sing the tunes which are used at the winter dances and at other feasts.

The scene of a feast is extremely picturesque. Along the elevated bench, which is built along the walls of the large wooden house, mats are spread, upon which the guests who are invited to partake in the feast sit down, wrapped up in their cedar-bark or woollen blankets, which they wear as the Romans wore the toga. The long raven hair is kept back by a gay kerchief or a piece of skin tied round the head. One man has the large drum, which is a good-sized box of bent-wood with the host's crest painted on the side ; several others have carved sticks for beating the time. In the middle of the house a blazing fire is burning, in which stones are heated, to be thrown into the large wooden kettles, thus making the water boil for cooking the meat. When all the guests are in, four songs are sung before dinner can be served. The time is beaten with the drum and the carved sticks, the rest of the men clapping their hands. At the large winter festivals the rhythm of these four songs is prescribed by long usage. The bars of the first are in five-eighths time ; two have a fast movement ; the last one is solemn and slow : —



The rhythm of the songs themselves is very irregular. Here is an example : —



The text of some songs of these Indians is highly poetical, as that of the following responsorium, — a mourning song that moves in a slow and solemn rhythm. A chief who had lost his child sings, and the mourning tribe respond.

Chief. — Don't mourn any more, don't mourn.
Chorus. — We do not mourn any more.
Chief. — He went up to play with his brethren the stars. Don't mourn any more.
Chorus. — We do not mourn any more.
Chief. — There he is hunting with the hunters the nimble deer.[1] Don't mourn any more.
Chorus. — We do not mourn any more.

[1] Hunters and deer are constellations.

Chief. — We will see his beloved face in the new moon. Don't mourn any more.
Chorus. — We do not mourn any more.

In another mourning song, the people, lamenting the death of a great chief, sing, "He fell, the pillar of heaven, and, falling, crushed all our joys."

These few examples will show that the mind of the 'savage' is sensible to the beauties of poetry and music, and that it is only the superficial observer to whom he appears stupid and unfeeling.

DR. FRANZ BOAS.

LONDON LETTER.

The case of M. Chauffat, a native of Haute Savoie, who has been overtaken by a trance in a French hotel in London, has been exciting very great interest among the section of medical men devoted to psychological studies. To-day is the seventeenth day of his cataleptic condition, from which he shows no sign of awakening, and the administration of food is not a little difficult. Chauffat has been a patient of the famous Dr. Charcot, in the Salpetrière hospital in Paris, where a large number of experiments are now being conducted upon hypnotizing. Dr. Charcot, however, particularly wishes it to be understood that Chauffat is not a hypnotized subject. The general state of his body is good, the temperature and pulse being normal, though the respiration is subject to great variation, changing from 15 to 28 in the course of a few hours. The only way in which he can be aroused sufficiently for the administration of food is by directing a strong ray of light on to his eyes. An examination of them by the eminent oculist, Mr. Brudenell Carter, showed that all the vessels, both veins and arteries, were much contracted and very small. Both sides of the body are alike in their condition, though the cataleptic condition is stronger in the limbs than in the trunk. The most extraordinary feature of the case is the remarkable results obtained by gently stroking Chauffat's arm. The limb, if raised upright, remains in that position indefinitely; and, when certain nerves are stroked, the fingers clinch tightly, the blood is forced from the extremity, the hand and fore-arm turn slowly round to the right till the strain is so great that the muscles stand out rigidly, the limb being perfectly rigid. On the other hand, the most gentle touch or stroking of the flexor of the fore-arm is sufficient to relax the whole. Without doubt, Chauffat's case is one of the most remarkable of the kind that has occurred in England, although they are more frequently to be met with in France. The following extract from the Proceedings of the Royal society of Edinburgh for Feb. 19, 1816, has recently been published, and has an interesting bearing on the case.

"Dr. Brewster communicated an account of the sleeping woman of Dunninald, near Montrose, drawn up by the Rev. James Brewster, minister of Craig. Margaret Lyall, aged 21, daughter of John Lyall, laborer, of Dunninald, was first seized with a sleeping fit on the 27th of June, 1815, which continued to the 30th of June; next morning she was again found in a deep sleep — in this state she remained for seven days, without motion, food, etc.; but at the end of this time, by the moving of her left hand and by plucking at the coverlet of the bed and pointing to her mouth, a wish for food being understood, it was given her. This she took, but still remained in her lethargic state till Tuesday, the 8th of August, being six weeks from the time she was seized with the lethargy, without appearing to be awake, except on the afternoon of Friday, the 30th of June. For the first two weeks her pulse was generally about 60, and previous to her recovery at 70 to 72. Though extremely feeble for some days after her recovery, she gained strength so rapidly that before the end of August she began to work at the harvest on the lands of Mr. Arkley, and continued without inconvenience to perform her labour.

"The account is drawn up by the clergyman of the parish, and is accompanied with the medical report of the surgeons who attended; to whose attestations are added those of Mr. Arkley, the proprietor of Dunninald, and Lyall, the father, and is in every respect entitled to the fullest credit."

The term 'hypnotism' was first introduced many years ago, by Mr. Braid, a surgeon of Manchester, to whom the demonstration of the condition was first due. An account of his work is given in Dr. W. B. Carpenter's 'Mental physiology,' pp. 601–610. The subject has very recently been revived, and has formed the subject of several curious experiments in the Salpetrière hospital and elsewhere. According to the *Zeitschrift für Elektrotechnik*, experiments have shown that there was no difficulty in producing all the ordinary hypnotic effects upon a distant subject by means of a telephone. The present writer, however, has not been able to verify the statement.

Rumors of important telegraphic and telephonic discoveries come to us from Belgium, as having been made by von Rysselberghe, but details are at present wanting. It is certain, however, that arrangements are in progress for the establishment of a telephone-line between Paris and London.

At the Colonial conference now assembled in London, some striking facts were put forward by Mr. Pender, chairman of the 'Eastern telegraph company,' as to the debt which commerce owes to science. Twenty years ago there were scarcely 2,000 miles of submarine cables: now there are 107,000 miles, of which all but 7,000 are under British control (the total cost being $185,000,000); and "cables can at the present time be laid with comparatively little risk of breakage, and with an almost certainty of efficient repair." The total land-lines are estimated at 1,750,000 miles, costing $260,000,000. W.

London, April 9.

EXPLORATION AND TRAVEL.

The Stanley expedition and Emin Pasha.

While Stanley is proceeding up the Kongo to relieve Emin Pasha, news has been received that the latter is safe and well, though unable to leave his province. A Somali trader from Uganda has arrived at Zanzibar, confirming former news that Emin Pasha was established at Wadelai. He had two small steamers plying on the White Nile and on Lake Mvutan. In November, four months later than the advices brought by Dr. Junker, Emin Pasha visited the capital of Unyoro, which is situated on the north-west shore of the Albert Nyanza. He was accompanied by Dr. Vita Hassan, ten Egyptian officers, three Greeks, and four negroes. From there he sent a message to Mwanga, the young king of Uganda, requesting an audience. The king consented to receive him if he came without his followers, and Emin Pasha thereupon went to him, accompanied by Dr. Vita Hassan and the three Greeks. After he had staid seventeen days with the king, he asked for permission to pass through his territory toward Zanzibar; but Mwanga, upon hearing this request, ordered them to return the way they came. The Somali who made this statement says that the messengers despatched from Zanzibar to inform Emin Pasha that Stanley had gone with an expedition by way of the Kongo to rescue him, were detained in Unyanyembe. The frequent news from Emin reaching us by way of Zanzibar encourages us to hope that he will succeed in leaving the district in which he is now imprisoned.

Meanwhile Stanley is proceeding by the Kongo route, and Tippo-Tip's couriers are on the way to Stanley Falls in order to make preparations for the northward journey. Stanley's observations and plans are set forth at some length in two letters from Zanzibar published in the London *Times*. On leaving Zanzibar on board the Madura, his expedition numbered 709 men. The contract he made with Tippo-Tip is of considerable interest. He found this enterprising trader to be of far greater importance than in 1877, when he escorted Stanley's caravan to the Kongo. It is practically in his power to close the roads leading from the east coast to the upper Kongo. Stanley engaged him and his followers to accompany him from Stanley Falls to the region north of Lake Tanganyika, and to have the ivory belonging to Emin Pasha — which, according to Dr. Junker, amounts to seventy-five tons — carried back to the Kongo. But, besides this, he has appointed him governor of the Stanley Falls station, which was lost to the Arabs some time ago. It will be remembered that the object for which the station was established was to prevent the Arabs from extending their influence farther down the Kongo. Since the loss of the station, they descend the river, and are said to have reached the Bangalla station. Tippo-Tip's duties will be principally to defend Stanley Falls, in the name of the state, against all Arabs and natives. The flag of the station will be that of the state. At all hazards, he is to defeat and capture all persons raiding the territory for slaves, and to disperse all bodies of men who may be justly suspected of violent designs. He is to abstain from all slave traffic below the Falls himself, and to prevent all in his command from trading in slaves. In order to insure a faithful performance of his engagements with the state, a European officer is to be appointed resident at the Falls. By this contract, the upper Kongo is actually surrendered to the Arabs, for those Arabs who were to be prevented from descending the Kongo beyond Stanley Falls are Tippo-Tip's men, who, to be sure, will not abstain from the profitable slave trade on the Kongo, as demanded by this contract. Stanley's action, and Baumann's description of Stanley Falls in the Proceedings of the Geographical society of Vienna, show that the Arabs are actually the masters of the upper Kongo, and that the Kongo Free State is utterly powerless there.

As the fate of Emin Pasha forms the central point of interest in Central Africa, some biographical notes may be welcome. According to Dr. Wolkenhauer (*Deutsche geogr. Blätt.*, 1887, No. 1), his name is Eduard Schnitzer, not Schnitzler, as he was generally called. He was born at Oppeln, in Prussian Silesia, in 1840, but his family removed soon after his birth to Neisse. After having gone through the gymnasium of that town, he studied medicine at the university of Breslau, and passed his examinations, about 1864, at Berlin. His favorite studies from early boyhood were natural sciences, more particularly zoölogy, and he had always longed to visit foreign countries. Having passed his examinations, he went to Turkey, and was appointed physician of the district and port of Antivari. In 1870 he became attached to the household of Ismael Hacki Pasha, whom he followed to Trebizond, Erzerum, Constantinople, and Yanina. When his patron died, toward the close of 1873, he accompanied his family to Constantinople. After a short visit to Germany in 1875, he returned to the Orient, and obtained an appointment as surgeon in the Egyptian army. Subsequently he served under Gordon Pasha, who appointed him surgeon-general, and, in 1878, governor of the Equatorial Province. His principal researches, besides his explorations and the administration of his province, were ornithological; and

among his collections which were sent to Germany are twenty-six new species. It is to be hoped that the gallant explorer will soon be saved from his perilous position, and succeed in taking with him his collections and the valuable results of his many years' researches in equatorial Africa.

Asia.

The observations of E. Michaelis on the signs of an ice-period in the Altai Mountains, mentioned in *Science*, Feb. 11, 1887, are confirmed by A. Bialoveski, who found glacier deposits, remains of moraines, and glacial striae in the southern part of the Altai (*Nature*, March 31, 1887).

La gazette géographique says that Sarat Chandra Das, an Indian explorer, who was sent out by the English government in order to study the religions of Indo-China. has arrived at Bangkok. He pretends to have explored the upper course of the Bramaputra and Jamdok-Tso (Palte Lake), which is situated about fifty miles south of Lassa.

Africa.

The new expedition of Lieutenant Wissmann left Luluaburg Nov. 16, 1886. The proposed field of exploration is the district between the Sankuru and Nyangwe. He went by steamer to the place where the Lubi discharges into the Sankuru. From there he will try to go north and to explore the unknown region where the Lulongo, Juapa, and Lomami have their sources (*Mouv. géogr.*, No. 7). During his stay in Luluaburg, Wissmann was not idle. He and de Macar, the new commander of the station, made a reconnaissance in the land of the Baluba and the basin of the Lubilash. They visited the residence of Mona Tenda, near the river Lukula. The country is inhabited by the Bashilange, and densely populated, the villages being built on the summits of the hills. The eastern bank of the Lukula belongs to the Baluba. While the country west of the river is very fertile, the Baluba country forms an undulating prairie. Though its appearance is barren and desolate, the population is very numerous. Unfortunately the visitors were attacked by the natives and forced to return to Luluaburg (*Mouv. géogr.*, No. 7).

In his letter to the London *Times*, Stanley criticises the methods of colonization of the Germans in eastern Africa. He advises them to penetrate the Somali peninsula instead of establishing scattered stations in the most unhealthy regions of equatorial Africa. He proposes that they should establish a permanent post or fort at the mouth of the Jub or Rufiji, and advance by degrees inland. In fact, the German East African association follows a similar course to the Kongo association by establishing factories on the coast and inland. The district they selected for their operations is one of the most important in Africa, and includes all the caravan routes from the upper Kongo and Nile to the harbors of the east coast. Stanley's observations in Zanzibar on the predominant influence of the Germans and the decreasing power of the English do not confirm his criticism.

America.

The Brazilian and Argentinian commissions for determining the disputed boundary of the territory of the Missions were going to meet in the beginning of April. Important additions to our knowledge of the geography of that district may be expected from their surveys.

Antarctic regions.

The cable informs us that Nordenskjöld is planning an Antarctic expedition, and that he assumes eighteen months for accomplishing it. The interest in Antarctic exploration is rapidly increasing everywhere. The Royal geographical society of London, the Scotch geographical society, the German Geographentage, the Australian royal society, have expressed themselves in favor of Antarctic explorations, but since Lieutenant Bove's unsuccessful journey, this is the first attempt of organizing an expedition.

NOTES AND NEWS.

The Elizabeth Thompson science fund, which has been established by Mrs. Elizabeth Thompson of Stamford, Conn., "for the advancement and prosecution of scientific research in its broadest sense," now amounts to $25,000. As accumulated income is again available, the trustees desire to receive applications for appropriations in aid of scientific work. This endowment is not for the benefit of any one department of science, but it is the intention of the trustees to give the preference to those investigations *which cannot otherwise be provided for*, which have for their object the advancement of human knowledge or the benefit of mankind in general, rather than to researches directed to the solution of questions of merely local importance. Applications for assistance from this fund should be accompanied by a full statement of the nature of the investigation, of the conditions under which it is to be prosecuted, and of the manner in which the appropriation asked for is to be expended. The applications should be forwarded to the secretary of the board of trustees, Dr. C. S. Minot, Harvard medical school, Boston, Mass., U.S.A. The new grants will probably be made in May, 1887. The following grants have been made: 1. $200 to the New England meteorological society for the investigation of

cyclonic movements in New England ; 2. $150 to Samuel Rideal, Esq., of University college, London, England, for investigations on the absorption of heat by odorous gases ; 3. $75, to H. M. Howe, Esq., of Boston, Mass., for the investigation of fusible slags of copper and lead smelting ; 4. $500 to Prof. J. Rosenthal of Erlangen, Germany, for investigations on animal heat in health and disease ; 5. $50 to Joseph Jastrow, Esq., of the Johns Hopkins university, Baltimore, Md., for investigations on the laws of psychophysics. The board of trustees consists of H. P. Bowditch, president ; William Minot, jun., treasurer ; Francis A. Walker ; Edward C. Pickering ; Charles Sedgwick Minot, secretary.

— The fish-commission schooner Grampus, recently finished, has been engaged during the winter in catching cod-fish and gathering cod-eggs, and also in catching mackerel. It is the purpose of the commission to study the migrations of the mackerel from its first appearance until it enters the Gulf of Maine. The seasons and conditions favorable to spawning will be closely observed. The migrations of menhaden, blue-fish, and other fishes, will also be studied.

— The conference of astronomers called by Admiral Mouchez, director of the Paris observatory, for the purpose of forming a plan of co-operation in photographing the whole sky, will doubtless result in the accomplishment of this project. The proposition is to enlist ten or twelve observatories in the undertaking, so located that their combined range will take in the whole sky. It is suggested that each plate be four degrees square, which if adopted, would require eleven thousand plates. It is estimated, that, with an average of one hundred plates per year from eleven observatories, each plate covering four degrees square, it would take ten years to complete the whole work.

— We learn from the *Athenaeum* that the Hibbert lecturer this year will be Professor Sayce, and the subject will be Assyrian and Babylonian religion. The lectures will be delivered at the end of April and during May, both in London and Oxford. The Hibbert trustees have also in the press a work by one of their scholars, Mr. H. W. Wallis of Cambridge, 'On the cosmology of the Rig Veda : a study in Indian logic.'

— Rev. W. Lucas Collins, editor of the popular series of 'Ancient classics for English readers,' is dead.

— Professor Möbius of Kiel is the new director of the Zoölogical museum at Berlin.

— Messrs. B. Westermann & Co., New York, have published a second edition of Lemcke's "An illustrated grammar of skat, the famous German game of cards now attracting so much attention."

— Entrance examinations for the Massachusetts institute of technology will be held in Boston, Mass., on Thursday and Friday, June 2 and 3 ; also in New York, Philadelphia, Montreal, Chicago, St. Louis, Cincinnati, San Francisco, Washington, Nashville, St. Paul, Atlanta, and Pittsburgh.

— The *Lancet* reports the case of a woman dying from myxedema whose temperature ranged from 66° F. to 76° F., the normal temperature being 98.5° F. The pulsations of this patient's heart were 36, and her respirations 12 to the minute. The temperature is said to be the lowest human temperature on record.

— The *New York medical journal* of April 9 contains a detailed account, with illustrations, of the induction balance and the telephonic probe employed for the detection and location of metallic masses in the human body.

— The *Boston medical and surgical journal* reports that a large number of calves from one hour to three days old are said to have been slaughtered in Herkimer and Oneida counties, and sent to New York, where they are put up as 'canned chicken.'

— From the report of the hospital for Chinese, in Shanghai, we learn that in China small-pox inoculation is still in vogue. For this purpose a rag is moistened with the variolous matter and placed in the nostril. That the disease is prevalent in China is easily understood after this explanation.

LETTERS TO THE EDITOR.

****The attention of scientific men is called to the advantages of the correspondence columns of* SCIENCE *for placing promptly on record brief preliminary notices of their investigations. Twenty copies of the number containing his communication will be furnished free to any correspondent on request.*

The editor will be glad to publish any queries consonant with the character of the journal.

Correspondents are requested to be as brief as possible. The writer's name is in all cases required as proof of good faith.

Mole-lore.

HERE are three items of mole lore in the District of Columbia : —

1. A mole's feet cut off and hung around a child's neck will help it in teething. In some instances in Virginia these odd amulets have been handed down, I am told, for generations. They are equally believed in by colored people of Maryland. 'That's what the old-time people say,' is the only explanation. The superstition comes into the District from both these neighboring states.

2. Once the mole was an over-proud young lady. She is condemned to travel under ground as a punishment for her pride. Unlike the former, this is told with a smile, and probably quite without belief.

It will be readily recognized as a myth of wide dispersion. Perhaps the delicate fur and the grovelling habits of the little animal account for it.

3. Once the mole had eyes like other animals, but no tail. He met a creature which ridiculed him for his poverty in this latter respect. The derision preyed on his mind, and, when he met a being who could help him, he petitioned for aid. He was told that he must give up his eyesight 'So he sold his eyes for his tail.' W. H. Babcock.

Washington, D.C., April 16.

Some hardy buds.

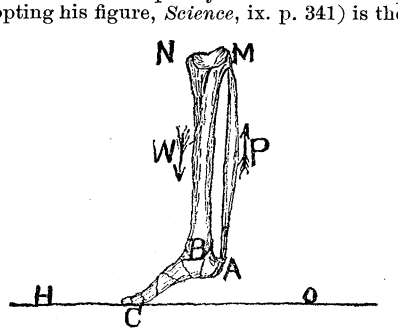
While in the country two weeks ago, my wife cut some branches from a pear and a cherry tree, and also from a lilac-bush, and brought them to the city. At that time the buds looked as they had all winter; in fact, we thought the pear cutting was dead. In a few days the buds commenced to open, and to-day the cherry-blossoms are out, as they would be on the tree, the blossoms of the pear are just opening, and those of the lilac are beginning to show. The water in which they were placed has been changed daily, and the cuttings kept in the sun as much as possible. It has occurred to us that such cuttings might be placed in rooms where there are invalids, both in homes and in hospitals, and give the sick a taste of the country which they could otherwise not get. It is no less an object of interest and instruction to the well: the daily, and I might say hourly, changes in the buds as they unfold are fascinating to watch, and even those whose lives have been spent in the country have never seen the gradual development of the blossoms as they can thus see them on the severed branches. J. H. R.

Brooklyn, April 8.

On tiptoe.

While feeling honored that the attention of so eminent a physicist as Professor LeConte should be attracted to the question which has been recently discussed in *Science* under this heading, it still seems to me, as it did when I called the attention of Professor Van Dyck to the matter, that the lever is of the first order,

Professor LeConte quietly assumes that the point *C* (adopting his figure, *Science*, ix. p. 341) is the fulcrum, but just there is the question. Suppose a person sitting down to put his toe against some object, and, by the same muscular action which raises the body on tiptoe, to push the object away. Here the case is evidently a lever of the first class, the fulcrum being the ankle-joint (*B*), and the weight the point of the toe's pressure (*C*).



Now suppose, that, in precisely the same way, he presses his toe against some firmer object, as a wall, and, instead of pushing it, pushes *himself* away.

I fail to see how it is other than an unnecessary complication, at least from a physiological standpoint, to suppose the fulcrum and weight to change places, so as to make the lever one of the second class. Further, in cases where the result is partially a movement of the object, and partially of the person's body, — as in rising on tiptoe upon a yielding object, — the complication of the solution upon the hypothesis that the lever is of the second class is further increased; whereas in every case, since the foot still turns upon the ankle-joint *B*, by regarding it as a fulcrum and the lever as of the first class, the conclusion reached by Professor LeConte, that $P : W :: CB : AB$, becomes an evident application of the general law of mechanics. Edwin J. Pond.

Austin, Tex., April 12.

Winds in Denver.

H. A. Howe, in *Science*, No. 216, asks "why winds blow at Denver from the north during the day, and from the south at night."

It is for these reasons: Denver is in a cañon running north (the mountains on the west, a slight elevation on the east, and a 'divide' on the south), through which flows Cherry Creek. Now, winds *invariably* blow up cañons during the day, and down them at night. This brings the question to, "Why do winds blow up cañons during the day, and down at night?" which I take to be the intended interrogatory. During the day, the sun heats the air, which, becoming light, rushes up the cañons, while at night the air becomes cool and seeks lower altitudes. Of course, the disturbed equilibrium increases the wind's velocity. I think I have crudely answered the question. F. F. Wyman.

Silver Reef, Utah, April 7.

Geographical centre of the United States.

If an area or district of country is mapped on a projection of small areal distortion, the geographical centre of the area may be defined to be the centre of gravity of the figure.

The problem to determine the centre, would, under this definition, resolve itself into the question of determining the centre of gravity of a plane figure of irregular outline. Of the various ways in which the centre of such an area may be found, the mechanical ones are perhaps of easiest application, and, on the whole, yield the most satisfactory results.

One method consists in tracing the outline of the area whose centre is to be determined, on stiff cardboard, then cutting out the figure along the boundary so traced, and balancing the resulting cardboard on a point; which point so found is the point sought.

Another way consists in cutting out the map, as before, along the boundary-line, and then suspending it behind a plumb-line, so that map and plumb-line hang from the same support: the projection of the plumb-line on the map is a line which passes through the centre of gravity of the area. By suspending the map successively from several differ-

ent points, a series of lines will be found, all of which theoretically pass through the centre of gravity of the figure.

Both of these methods have been tried on the map of the United States, and with the following result: —

A base map of the United States (scale about 112 miles to the inch) was cut out along the boundary, and the map so cut out suspended by a pin stuck through it. From the same pin a plumb-line was suspended. The map was swung upon the pin, and allowed to come to rest several times, and its mean position inferred. A line was then drawn on the map, representing the projection of the plumb-line upon the map in its mean position.

This process was repeated in several positions of the map, and a series of intersections determined,

Northernmost latitude (Minnesota)	49° 24′
Southernmost " (Florida)	24° 23′
Mean latitude	36° 54′

Northernmost latitude (Alaska)	71° 22′
Southernmost " (Florida)	24° 23′
Mean latitude	47° 53′

each intersection representing the centre of gravity, resulting from a pair of observations.

The centre sought was then assumed from an inspection of these points. From this adopted centre a circle with a radius of about one-sixteenth of an inch (some seven or eight miles in nature) would include all points except two resulting from very acute intersection, and which were rejected.

Again, a similar map was mounted on stiff cardboard, and then cut out along the boundary, as before. This was then balanced on the point of a spindle. It was balanced with the face of the map down, and then with the face up; and both balancings agreed in locating a point not differing visibly from the point determined by the preceding method.

This point, which according to one definition is the centre of the United States (Alaska excluded), is situated in latitude 39°.8 north, and longitude 98°.8 west of Greenwich. Platting this position on the land-office map, the point is found to be in *Cora township, Smith county, Kan.*, some ten miles south of the southern boundary of Nebraska, and a little to the westward of the middle of the state of Kansas.

These methods are directly applicable only to cases where the desired point is included in the given area. Such is the case with the United States, excluding Alaska.

If, now, we are to determine the centre, *including Alaska*, it will be necessary to determine the geographical centre of Alaska, and then determine, on the line joining these two centres regarded as a lever arm, the fulcrum between weights proportional to the areas of the United States alone, and of Alaska alone.

The centre of Alaska was found by the suspension method only. The intersections were all closely accordant, and locate the centre on the head waters of the Kuskokwim River in latitude 63°.4 north, and longitude 151°.5 west. The map used for the purpose was the base map of Alaska and adjacent regions, prepared some years ago by the coast survey.

These two centres found, as above described, were noted on a base map of North America, and joined by the projection of an arc of a great circle. This line was then divided into parts inversely proportional to the respective areas of the United States alone, and of Alaska alone; and the point so found is adopted as the centre sought. For this purpose the area of the United States was taken as 3,026,000, and of Alaska, 583,000 square miles. The centre is found to be in latitude 45°.0 north, and longitude 103°.5 west from Greenwich; which locates it near Slave Butte, Dakota, some twenty-five miles east from the boundary monument between Dakota, Montana, and Wyoming.

If we assume that the geographical centre is determined by the intersection of a parallel and meridian, which are the means of the extreme latitudes and longitudes, then we shall have for the United States, *excluding* Alaska, —

Easternmost longitude (Maine)	66° 57′
Westernmost " (Washington Territory)	124° 47′
Mean longitude	95° 52′

and, *including* Alaska, —

Easternmost longitude (Maine)	66° 57′
Westernmost " (Alaska)	187° 32′
Mean longitude	127° 14′

In the first case (excluding Alaska) the centre lies in the Indian Territory, some seven miles from the southern boundary of Kansas, and about twenty-five miles a little west of south of Independence, Montgomery county, Kan.

In the second case (including Alaska) the centre is found to be in the Pacific Ocean, about one hundred and twenty-five miles a little south of west from Cape Flattery. This rather startling result brings into conspicuous notice the extension of the Alaskan possessions to the westward.

The only reference to the geographical centre of the United States that has met our notice is contained in the 'Fourth biennial report of the state board of agriculture to the legislature of the state of Kansas,' where it is stated, on p. 493, that "*Kansas is the central state of the Union, the exact geographical centre of the United States being at a point lying within a few miles of the centre of the state.*"

MARCUS BAKER.

Washington, D.C., April 15.

Death of Dr. Albert Kellogg.

Among the recent deaths of scientific men, that of Dr. Albert Kellogg, the veteran botanist of the Pacific coast, is made known in the San Francisco papers.

He died in Alameda, Cal., on the 31st of March, at the age of seventy-four years. He was a native of New Hartford, Conn. For over thirty years Dr. Kellogg has been identified with the botany of California and the adjacent region, commencing Sept. 4, 1854, when he exhibited a drawing and specimen of a plant from the "salt marshes of the Bay of San Francisco, the Frankenia grandifolia," at a meeting of the California academy of sciences, of which he was one of the founders. During all these years he was constantly active, either in the field or the herbarium. He was exceedingly skilful with his pencil and brush in rendering from nature, and up to nearly the last moment was engaged in making drawings of the floral and sylvan species of the Pacific

states, particularly the sylva, with the intention of illustrating a work on the indigenous trees of California. He must have left a large and valuable series of figures, if not a completed monograph, of the botanical forms of the region referred to.

The published results of his various and prolonged investigations have appeared from time to time in the Proceedings and bulletins of the California academy and elsewhere; and his name holds a conspicuous place in all of the principal works relating to the botany of the western coast of North America.

In 1867 he visited the then Russian territory of Alaska in the capacity of surgeon and botanist to the special expedition of that year, having received the appointment from Prof. George Davidson, who had charge of the scientific division on that occasion.

Of his personal qualities, all who knew Dr. Kellogg will bear testimony to his simplicity, genuineness, and purity, and his invariable kindly disposition. His was altogether a rare and most lovable character. It may properly be said that his nature was in many ways as attractive as the beautiful forms he studied. Considering the period of his arrival in California, and the ruling passion and influences which governed the community at that time, as compared with his refined tastes and quiet ways of life, a most extraordinary contrast is presented. In the light of ordinary experience, it is hardly conceivable of a human being, among human beings of the same race, more absolutely out of place than he. However incongruous the surging tide and rush of affairs about him, he held the noiseless tenor of his way. His gentle life has passed. He will be affectionately remembered by many. R. E. J. S.

U. S. nat. mus., April 16.

The barometer during thunder-storms.

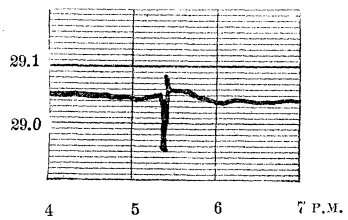
A sudden increased height of the barometric column lasting a short time, which almost invariably occurs with thunder-storms, has recently attracted considerable attention. German writers claim that notices of the phenomenon can be traced back to various observers in that country for more than one hundred years. Dr. Hellman finds a notice of it in the work of Herr J. J. Planer in the last century, and Dr. Ferrari finds a notice of it in the writings of Toaldo of Italy in 1794.

Mr. M. J. Johnson spoke of it in a paper read before the British association for the advancement of science in 1855. Since the somewhat general introduction of barographs, it has been so frequently and so widely noted, that I think it is now accepted as a characteristic phenomenon of thunder-storms.

Dr. Cirro Ferrari, however, claims that the little ridge of increased pressure attending the thunder-storm is only a part of the phenomenon. In front of this ridge he claims that there is a small trough or area of diminished pressure, and the most violent part of the thunder-storm falls between the two.

There are, however, a number of well-authenticated cases in which the barometer showed no indications of a diminished pressure preceding the passage of the storm, but showed an increased pressure during its passage. One of the most marked cases is given in the *American meteorological journal* (vol. i. p. 156), where it is shown that during the passage of a thunder-storm the barograph at Ann Arbor, Mich., rose .13 of an inch; but for ten hours preceding, and for twelve hours following, the storm, the recorded pressure did not vary perceptibly from 28.94 inches.

No marked thunder-storm has passed over Blue Hill since the starting of the barograph at the observatory, without giving indications of an increased pressure during the storm; but only a few have given indications of a diminished pressure preceding the storm, except the slow, steady fall of pressure in a general storm, or broad secondary, within which the thunder-storm occurred. There have, however, been a few marked cases of a decided diminution of pressure attending certain storms. So far as the records show, all of these storms were attended by very high winds. In a few of the cases the sharp depression of the barometer lasted fifteen or twenty minutes, and was followed by a rise lasting slightly longer. One of the most marked cases occurred on July 21, 1886, and the depression lasted only a few minutes. A copy of the barograph trace during this storm is given in the following diagram.



This thunder-storm, which was characterized by very vivid lightning, lasted from about 5 to 5.45 P.M. It was attended by a most violent squall, lasting from 5.12 to 5.17 P.M., during which a large dog-kennel was taken up and smashed to pieces, rain-gauges were overturned, and other damage done. During this squall the barograph pencil fell about .10 of an inch, giving the trace as seen on the diagram. Overlooking this sudden fall, it is seen that there was a gentle upward swell of the barograph curve, lasting thirty or forty minutes, during the passage of the thunder-storm.

I am led to infer that the sudden fall of pressure was due to the dynamic effect of the wind in sucking the air out of the building, while the rise in pressure was due to other causes. It has been found that a greatly increased wind-velocity usually precedes or accompanies the immediate beginning of a thunder-storm; and it is suggested that the diminished pressure which has been found by Dr. Ferrari in front of thunder-storms is due to the dynamic action of the wind on the barometer or its environment, something like the action of a Sprengel air-pump.

There yet remains, however, to be explained, the rise in pressure during thunder-storms. There are a number of reasons for believing this not due to a lower temperature or falling rain. Professor William Ferrel, in conversation, suggested that this also was a dynamic effect of the wind, and was due to a reactionary effect of the sudden expansion of the air ascending in thunder-storms, something like the recoil which takes place from the sudden expansion of ignited powder. There are undoubtedly very rapid moving currents of air in thunder-storms, and it may well be that their sudden expansion or collision produces the effect in question.

According to the view here presented, the following are some of the actions and reactions taking place in thunder-storms: —

1°. There exists above the earth's surface strong currents of air moving inward toward the central line or area of the thunder-storm. This is attested by balloon observations and by observations of clouds.

2°. There arises from the sudden expansion of air entering the vortex of thunder-storms from beneath a reaction which produces a compression of the air near the earth's surface, and a rise of the barometer.

3°. This compression causes the air near the earth's surface to tend outward in all directions from the centre of a thunder-storm; but the outflow in moving storms is only felt, or attains its greatest strength, on the front of the storm, where the direction of the outflow is combined with the progressive motion of the storm. In tornadoes the vortex usually reaches to the earth's surface, and there is no place for a vertical reaction; but where the vortex is some distance above the earth's surface, there is the same evidence of a straight outblowing wind moving in the direction of the tornado, as there is in a thunder-storm.

4°. This rapidly outflowing current, by its dynamic action on the barometer or its environment, frequently or generally causes a depression of the barometer in the front of thunder-storms, where the outflow is most violent. H. HELM CLAYTON.

Blue Hill meteor. observ., April 10.

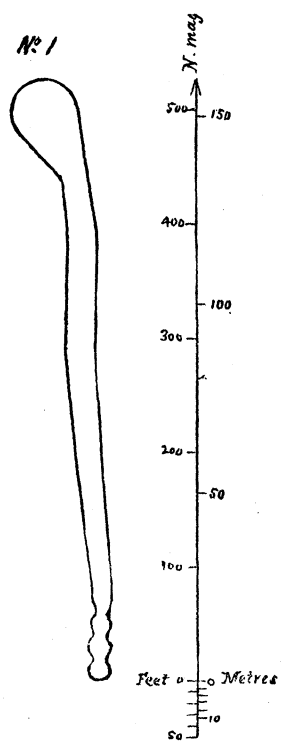
Snake and snake-like mounds in Minnesota.

From time immemorial a certain mythical or superstitious interest has attached itself to the serpent — the wisest of the beasts of the field — amongst most nations, whether civilized or barbarous, and his pictured or sculptured delineations have been the occasion for much writing on the part of antiquarians. In North America the creature has been depicted by the ancient inhabitants in various ways; as, for instance, by carvings on rocks, by outline arrangements of stones or bowlders placed on the ground, and, more sparingly, by mounds of earth. The latter belong to the class of earth-works known as 'effigies,' of which the 'Great Serpent' of Adams county, O., stands an unequalled representative. Indeed, with the exception of this one, no mounds representing snakes have hitherto been delineated and published, except one or two somewhat dubious specimens in Wisconsin.

In the course of my surveys in Minnesota, I have met with at least two such effigy-mounds, which, with some others looking suspiciously like tadpoles, I have drawn in plan for the engraver. They are numbered and described as follows: —

No. 1 is situated on the west side of St. Croix Lake, on the town-site of Afton, Washington county. The land here slopes toward the lake, and the Rattlesnake lies just above high-water mark. The head is $5\frac{1}{2}$ feet high, 88 feet long, and 56 feet wide at the broadest point, which is also the highest, from which it gradually descends to the body. Where the head joins the body the embankment is 22 feet wide and nearly $2\frac{1}{2}$ feet high. The body is but slightly curved. In the next 160 feet the width increases to 26 feet, but the height drops to 2 feet. From this point it gradually diminishes to 18 feet in width and 1 foot in height. Connected with the extremity or tail, there are three small mounds whose bases interlock, thus forming the rattles. The last of these mounds is 20 feet long and 18 feet wide, and the two between it and the tail are each 18 feet in diameter, and all three are of the same height as the end of the tail. The total length of this effigy is 534 feet. On June 25, 1883, when this survey was made, in addition to the snake, there were four round mounds and one embankment in the group. Formerly there were other mounds, but they had been demolished.

No. 2 is on the east side of Spring Creek, some three miles westward from Red Wing. It has a perceptible head, which is 8 feet wide and 1 foot high; the neck is nearly 7 feet wide and 10 inches in height. From the latter point the body gradually increases its width until the middle is reached, where it is 14 feet wide and 2 feet high: thence it decreases to the



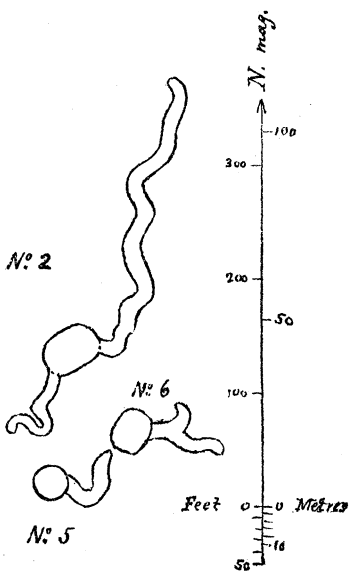
end of the tail, which is 8 feet wide and 1 foot high. Its total length following the curves is 430 feet. The mound which covers the body near the head is 52 feet in length, 36 feet wide, and 5 feet in height. From general appearances it would seem that it was built after the snake was constructed; for the slope of the mound where it strikes the body of the snake is somewhat irregular, and indicates that its builders were at a loss to know how to join them symmetrically. These irregularities are not caused by the dirt washing down from the top of the mound, for otherwise it is perfectly symmetrical and the base well defined.

No. 3 is in another group of mounds about 250 yards down the same creek from the preceding one. The head is circular in form, being 40 feet in diameter and $3\frac{1}{2}$ feet high. The body at the junction with

the head is 20 feet wide and 1½ feet high, but gradually decreases to a point 97 feet distant, where it is but 14 feet wide and 1 foot high. Thence to the end of the tail it retains the latter width and height. Its total length, following the curves, is 290 feet.

No. 4 is in the same group, and lies south-west of the tail of No. 3, 35 feet. The head is circular, being 36 feet in diameter and 4 feet high. The body at the junction with the head is 16 feet wide and 1½ feet high. From this point it gradually decreases in width to the end of the tail, which is 12 feet wide and 1 foot high. The extreme length of this effigy is 300 feet. The heads of Nos. 3 and 4 are away from the creek. In addition to Nos. 3 and 4, there are nine small round mounds in the group.

No. 5 is in the same group with No. 2, and its head is 40 feet south-east from the head of the latter, and rests on the edge of the plateau. The head is

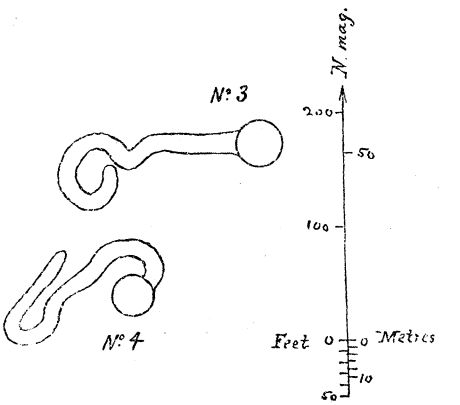


30 feet in diameter and 4 feet high. The body at the junction with the head is 20 feet wide and 1 foot high, and does not vary until within 20 feet of the end of the tail. From this width it gradually diminishes to 6 feet. Its total length, following the curves, is 105 feet.

No. 6 is close to No. 5, its head being only 10 feet from the end of the tail of the latter. The head differs from the others in being oblong, and is 40 feet long, 30 feet wide, and 3 feet high. About one-third of the way from the head the body forks, forming two tails of unequal length. Near the head the body is 16 feet wide and 1½ feet high, and at the end of each of the tails 8 feet wide and 1 foot high. Its greatest length, from the extremity of the head to the tip of the longest tail, is 105 feet.

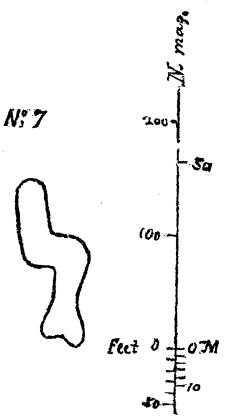
The heads of Nos. 2, 5, and 6 are towards the creek, and, in addition to them, there are sixteen mounds and embankments. Both of these Spring Creek groups are on a plateau some 40 feet above the water, and were covered with brush and young timber when the survey was made (Sept. 5, 1885), but Nos. 3 and 4 are now cultivated.

No. 7 is near the south end of Lake Koronis, west of the outlet, in Meeker county. Although this mound is serpentine in form, and apparently has an open mouth, it is hard to determine exactly what it is intended to represent. The head at its widest point is 36 feet broad and 2½ feet high. The body varies from 20 feet in width at its junction with the head, to 34 feet near the middle and 25 feet near the end of the tail, and is 2 feet high. Its greatest



length, following the curve, is 167 feet. In addition to this stumpy snake, there are thirty-two other mounds and embankments in the group. Directly opposite, on the east side of the outlet, there is another small group of mounds, the largest of which is nearly circular in form, and is 19 feet high. These groups were surveyed Nov. 8, 1886.

The reader fond of comparison can, if he pleases contrast these Minnesota serpents with the Great Serpent of Ohio, by making use of the following di-



mensions of the latter, as measured Feb. 18, 1886: total length from tips of jaws (if closed), following the windings of the body, to the end of the convoluted tail, is 1,020 feet; length of head, about 120 feet; width of head, 80 feet. The body and tail vary in width from about 30 feet at the neck, to 8 feet at the tip of the tail, and in present height from 3½ feet to 1 foot.

T. H. LEWIS.

St. Paul, Minn., April 6.

SCIENCE.—SUPPLEMENT.

FRIDAY, APRIL 22, 1887.

CO-OPERATION ON THE CONTINENT OF EUROPE.

I. — FRANCE.

ABOUT a year ago the British minister for foreign affairs addressed a circular to her Majesty's representatives at Paris, Berlin, Vienna, Rome, Brussels, The Hague, and Stockholm, indicating certain information as to co-operation in those countries which the government desired to obtain. The official replies to the circular contain a great mass of information as to co-operation, much of it difficult to be obtained by any one save a government official. Much of the value of the reports is concealed because of their not having been edited or compiled in any way. Each investigator obtained such facts as he could, and stated them in the way most convenient to himself. We shall call attention to such facts in the reports as are of value in connection with the general attention now being given to co-operation in this country.

The principal questions to which replies were desired were these : —

1. To what extent have industrial co-operative stores been established among the working-classes, and upon what basis?

2. (*a*) How far have co-operative workshops been established either by associations of workmen or by arrangements between employers and employed?

(*b*) Have they been successful commercially, and how far do they prevent strikes and other disputes?

(*c*) Upon what terms are profits usually divided in such workshops?

3. Are there any successful co-operative or people's banks, and what is their mode of operation?

4. Are there any instances of co-operative societies which provide social, educational, and recreative facilities for the working-people on a self-supporting basis?

5. Are there any co-operative societies for providing improved dwellings for artisans and laboring people? What system do they adopt, and with what success?

6. Is agriculture carried on by means of co-operation with any success?

7. Give details of any co-operative arrangements for carrying on shipping, fishing, and industries other than those already mentioned.

From France comes the answer that save at Lyons, the system of co-operation for diminishing the cost of articles of daily use is rarely met with. Owing to the nomad habits of the working population of Paris, it is particularly neglected in that city. At Mulhausen in 1832 the first instance of a French effort in this direction is found, in the establishment of a co-operative bread-store which managed to realize a profit, while supplying its members with bread at a reduction from the ordinary retail price. In 1849 this association numbered fifteen hundred members. The early attempts at co-operation were made at the instance of the employers, and not at that of the workmen. Lyons has been the seat of numerous co-operative enterprises, most of which were started by workmen. The co-operative stores in France are either for bread or meat alone, or for groceries, combined sometimes with clothes, drapery, and objects of household use. The bread-stores have the most success. The Angoulême store sold in 1874 — eight years after its foundation — five hundred thousand kilos of bread at about five centimes a kilo below the price asked by private bakers.

The last general statistics of co-operative supply associations are those of 1869, when there were in France and Algeria together about a hundred and twenty co-operative bakeries. Since then many others have been formed, but though increasing, co-operative supply has taken no great hold in France.

Co-operative workshops, however, have been in existence since J. Buchez began an agitation in their favor, as long ago as 1830. The main result of Buchez's teaching was a jewellers' association. The system of this co-operative society was to put by a seventh of the profits for the inalienable capital or foundation fund, and to divide the remainder amongst the members : one half of this remainder was paid over at once; the other half, left in the business till the member's death or retirement, when it was to be returned. The working-members were paid weekly an amount corresponding to the usual wages paid for the work they may have done, and the rules of the association laid down that there should be six working-days a week, of eleven hours each, and that whoever stopped work for three days without the per-

mission of one of the two managers (who were chosen by election) should be fined, and if the offence were repeated during the year, the fine was doubled.

Before the revolution of 1848 the French government was very jealous of innovations not emanating from itself or submitted for its approval; but after 1848 the right of workmen to associate so as to enjoy the profits of their work was recognized, and co-operation became popular. On July 5, 1848, the chamber passed a decree which provided, that, in order to encourage the spirit of co-operation, a fund of three million francs should be placed at the disposal of the minister of agriculture and commerce, to be divided among co-operative associations spontaneously formed either between workmen, or masters and workmen. Shortly afterwards a committee of sixteen met to distribute this state aid. Five hundred requests for loans from this fund were received in a single year, and many associations came into existence solely for the purpose of obtaining a share of the subsidy. As a matter of fact, the major part of the loan was given to employers in want of temporary assistance, who failed to comply with the provisions of the statutes as to their relations with their workmen. The results of this government aid are said to have been good, and some saving was effected by employing these associations instead of contractors on publics works.

The *coup d'état* of 1851 gave a shock to co-operation in France, and the associations dissolved, fearing punishment as socialists.

Whilst the movement was thus generally arrested by the workmen's dread of the government, a few new co-operative associations were quietly started. The first of which there is any notice was one of dyers, at Villefranche, in 1856; in 1858 there were formed co-operations of tailors at Toulouse, of carpenters in Paris, and of dyers at Tarare; in 1859, of house-painters in Paris; and in 1860 and 1862 co-operative workshops were started at Marseilles and Montpellier.

In 1864 the emperor showed that he had no opposition to co-operation by protecting the first branch of the famous Société internationale. In 1865 he went a step further, and caused to be drawn a *projet de loi* creating a new form of association for workmen's co-operative societies. This effort was not wholly successful, and an inquiry into the whole working of co-operation was instituted. The evidence was of much interest, and tended to establish the fact that the labor of an associated workman is better than that of the unassociated. In 1868, when co-operation was growing in favor, the failure of the Crédit au travail — a society established to give credit to co-operation by discounting the paper of the associations, and by opening a credit with them on suitable security — put a sudden stop to all co-operative progress. The Crédit au travail failed, not because of losses, but because the capital of the bank was locked up and unavailable. Neither the Franco-German war nor the Commune seem to have affected the co-operative societies. The period between 1870 and 1880 was largely devoted to talk and the elaboration of impracticable schemes, and it was not until the strikes of 1879 and 1880 that general attention was again turned to co-operation. A congress of workmen, meeting at Paris in 1881, advocated co-operation through the trades syndicates, and a number of societies were formed in this way. In 1883 M. Waldeck-Rousseau, minister of the interior, appointed a commission to investigate co-operation, and the results of the inquiry fill two large volumes. The evidence given before the commission by the managers of thirty-four Paris co-operative workshops was very detailed and in many respects valuable. The three principal names in connection with co-operative production in France are those of M. Leclaire, the painter; M. Laroche Joubert, the Angoulême paper-manufacturer; and M. Godin, the founder of the Familistère. What the associations organized by these men have accomplished is well known.

The details regarding co-operative credit institutions in France present little that is new, and building associations are very rarely found. Indeed, no instance of workmen alone combining for this object is known. One reference to education in the statutes of a co-operative association of tin-workers is worth noticing. It reads thus: "As immorality proceeds from want of instruction, every member who has children is bound to give them instruction according to his means, under pain of exclusion from the society after two warnings given at intervals of three months."

Co-operative agricultural associations do not exist in France, and have proved a failure in Algeria. On the Mediterranean as on the Newfoundland coasts, it is usual for the fishermen to share the profits with the owners and masters of their crafts. The usual plan of division in the neighborhood of Marseilles is that half the take belongs to the owner of the boat and gear, the other half to the captain and crew *pro rata*. The system of giving the hands regular wages instead of a share in the profits is now on the increase.

DR. EMERY of Brooklyn reports the poisoning of thirty-two boys at an orphan-asylum in that city from chewing the inner bark of the locust-tree, which they stripped from fence-posts.

SANITARY EXAMINATIONS OF WATER, AIR, AND FOOD.

THE first edition of this book, which appeared in 1878, supplied a want, which had long been felt by health-officers, for a book which would help them to solve the problems which presented themselves for solution almost daily in their efforts to provide, for those committed to their care, pure water, air, and food. Dr. Fox's brochure on water-analysis was recognized as a work of great value, and two editions of it had been exhausted. When a third edition was called for, its scope was extended by adding sections on the examination of air and food. In the section devoted to the sanitary examination of drinking-water, we find all the well-known tests for the determination of organic matter, and, in addition, the biological method of Koch, which, in Germany at least, is regarded as being as important as the chemical analysis. Chemistry gives no indication of the presence or the number of micro-organisms; and there is no doubt that water has been declared suitable for drinking-purposes, as a result of chemical analysis, when, had the biological method been known and employed, a far different opinion as to its potability would have been given.

The determination of the nature and life-history of the microbes found in water is too difficult for the health-officer, unless he be at the same time a bacteriologist, and so situated as to be able to investigate them in a properly equipped laboratory; but the ability to ascertain whether their number in a given water is beyond the normal amount is certainly within his reach. The methods to be employed in such an examination are fully described, and the apparatus abundantly illustrated, in the work before us. In a table given by the author, showing of what this method is capable, it is observed that the number of micro-organisms in the different metropolitan waters varies markedly at different seasons, and in the waters as compared with each other. In the water of the Thames at Chelsea, in January, there were 8 in one cubic centimetre; in February, 23; in June, 81; in September, 13; and in November, 3. In the water of the River Lea there were 25 in January, 121 in May, and 317 in December. The water of the Kent company leaves the well almost wholly destitute of organic life, and the few organisms which it contains are imported into it *en route* to its supply.

In the chapter descriptive of the microscopic examination of water there is much that is valuable. By the aid of the microscope, an approximate estimate may be made of the number of micro-organisms and the diagnosis of the kind,—whether bacteria, bacilli, micrococci, vibrios, spirilla, etc. The kind of animal and vegetable life seen in water gives a certain clew to the description of the water under examination. The Infusoriae, Confervae, and Vorticellae are the inhabitants of the least pure of spring-waters; then come the diatoms and desmids; Entomostraca, or water-fleas, are seen in spring-ponds, lochs, and impounded waters; euplota and fungoid growths abound in ditch and pond waters, and in well-water polluted with filth; whilst bacteria, paramecia, and spirilla are prominent in sewage-polluted water. Dr. Frankland regards the presence of any thing like a moving organism in a water as a danger-signal, for the reason that, if the poisons of such diseases as cholera and typhoid-fever attach themselves to particles of organic matter, and can operate in inconceivably minute quantities, as is generally believed, there is a possibility of the disease-ferment or germ of such maladies accompanying elementary forms of life. Two plates are given of microscopic objects found in drinking-water.

In the section which takes up the sanitary examination of air, the author describes the various impurities found in air which render it unfit for respiration, including sewage emanations, poisonous gases and injurious vapors, emanations from ground having damp and filthy subsoil, and from churchyards, and the deleterious effects on health of impure air in our houses. The methods for the detection and estimation of the amount of the most important impurities found in the air are fully dealt with, including both the microscopical and biological methods. Chapters are also devoted to ozone, temperature, solar radiation, barometric pressure of the air, direction of the wind, etc., and their relations to health.

One of the most interesting chapters in the book is that which treats of the meteorological conditions which appear to favor or retard the development of certain diseases. Of these, twenty-one are mentioned,—surgical fever and shock after operations, small-pox, measles, whooping-cough, scarlet-fever, typhus, typhoid, intermittent fever, diarrhoea, dysentery, cholera, bronchitis, pneumonia, asthma, phthisis, diphtheria, hydrophobia, erysipelas, puerperal fever, insanity, and rheumatism. Small-pox has been found, in London and in Sweden, to prevail more from November to May than from May to November. Measles is most prevalent towards the end of March: it gradually declines, and by midsummer disappears. Diarrhoea is a summer-autumn complaint, and typhoid a late-autumn fever. The latter is more prevalent after dry and hot summers than after those which

Sanitary examinations of water, air, and food. By CORNELIUS B. FOX. 2d ed. Philadelphia, Blakiston. 12°.

are cool and wet. Bronchitis, pneumonia, and asthma increase as the temperature falls, and diminish as it rises. The damp, cold days of November, and the dry, cold days of the early months of the year, have been most prolific in cases of diphtheria. As to hydrophobia, the hot 'dog-days' of summer are generally considered to be those during which this disease is most prevalent; and this ancient belief is justified to some extent by facts, although we must remember that it shows itself to be independent, in its spread, of a high temperature, as the mortality in London during thirty years proves. The number of cases is as numerous in December as in August. More persons, doubtless, are bitten by dogs in hot weather, because dogs are more irritable during this season. We want an answer to the query as to the percentage of cases of hydrophobia in those who are bitten in each month of the year, before we can determine with certainty the influence of meteorological conditions on the disease. In this section are also given directions for observing the meteorological states and variations in the conditions of the air, as to its pressure, temperature, and moisture, the direction and strength of the wind, and its electrical state.

The last section of the book is taken up with a consideration of the food, its impurities, and methods of inspection and examination, including the inspection of meat, poultry, game, fish, fruit, and vegetables. Separate chapters are devoted to tinned provisions, corn, flour, bread, and milk. On the subject of tinned provisions, or 'canned goods,' as we should call them, Dr. Fox says that preserved Australian meats, and American tinned fish, fruit, etc., are apt to become impregnated with small quantities of lead from the solder and tin, which frequently contain, as impurities, arsenic and antimony. The vegetable and other acids associated with these provisions have a corrosive effect, which is increased by the galvanic action set up between the metals. In the chapters on milk and its examination the author gives numerous instances of disease caused by impure milk or by that from sick cows. The evidence that tuberculosis may be thus communicated is very striking and very convincing, if, indeed, there be any at the present day who, having given the subject any consideration, doubt it. Taken as a whole, this work of Dr. Fox is an excellent one, and should be in the library of every sanitarian and physician.

A physician of Caracas reports, that, during an epidemic of yellow-fever which occurred in that place, one of the victims was a monkey. After an illness of four days, the fever proved fatal.

SCIENTIFIC WRITINGS OF JOSEPH HENRY.

At last, although somewhat tardily, as it has seemed to many, the regents of the Smithsonian institution, by the publication of these volumes, have enabled the general public to form a correct estimate of the great services of its first secretary, and have justified the opinion, long held by many of his countrymen, that Joseph Henry was unquestionably the first American physicist of his time. The Smithsonian institution, with the national museum, has been generally recognized as a monument to his wisdom, foresight, and patriotic self-sacrifice. How great this sacrifice was, demanding, as it did, almost total neglect of original research, — which he so loved, and for which he was so well fitted, — will be clearly understood on a perusal of these volumes.

The published papers of Henry, especially the earlier, and in many respects the most valuable, have long been well-nigh inaccessible. In later years he was too busy to follow the example of other eminent philosophers in collecting, editing, and republishing the work of his early years. Although an avenue for such reproduction of his numerous contributions to science was always open to him in the publication department of the Smithsonian institution, he never consented to utilize the facilities which he had so thoughtfully perfected for his fellow-workers, and which have proved such a boon to science and to scientific men.

The two handsome volumes now issued, naturally include a wide variety of subjects. The collection of papers is divided into two parts: a chronological arrangement is, in general, followed. But in order to equalize the size of the two volumes, the elaborate studies of and reports upon various phenomena connected with the transmission of sound, made between 1873 and 1877, while Henry was a member of the lighthouse board, are inserted out of their regular order, in the first volume.

Part i. includes papers published while a professor at Albany and afterwards at Princeton. This record covers a period of twenty-three years, from 1824 to 1846. It is contained in the first 260 pages of the first volume. Part ii. contains his scientific work during the remaining thirty-two years of his life, while director of the Smithsonian institution, from 1847 to 1878. Physicists will generally be most interested in part i., which contains nearly all of his original researches in electricity.

Born only five years later than Faraday, much

Scientific writings of Joseph Henry. 2 vols. Washington, Smithsonian institution. 8°.

of Henry's work ran parallel with that of the most distinguished experimental physicist of this or, indeed, any age. In several instances they attacked the same problem almost simultaneously, and often independently of each other. The great discovery by Faraday, on Sept. 24, 1831, of electro-magnetic induction, inaugurated an era of greatly increased activity in electrical research. Henry had thought much concerning the relation of magnetism to electricity, and had devoted the early part of the same year to his very important research looking to the improvement of the electro-magnet, with the intention of making use of it in an attack upon the then unsolved problem. The pressure of other duties prevented him from taking up the work until after the commencement of Faraday's success, but his improvement of the magnet was of sufficient importance to stand alone as a most valuable contribution, since through it Morse's system of telegraphy was made possible.

He at once repeated Faraday's experiments, and extended them, with interesting results. The difficulties under which he labored, arising out of his occupation, and also from the difference, far greater then than now, between London and Albany or Princeton as centres of intellectual activity, were more considerable than those which his distinguished contemporary was obliged to overcome. Those were the days in which quantitative measurements in electricity were made by comparison of sparks produced on file and rasp, by observing rapidity of decomposition, by the magnetization of sewing-needles, or in which men *felt* their way to results through shocks in the arms, fingers, or tongue. In those days batteries were inconstant and short-lived, connections were made with mercury cups, conductors were carefully insulated by a silk covering put on by the experimenter himself, and 'bell-wire' was almost the only available material for circuits. Henry independently produced the spark from the magnet, but afterwards learned that he had been anticipated in the observation in England. In 1832 he discovered self-induction in a long wire, and correctly, though somewhat hesitatingly, interpreted the phenomenon. This was not observed by Faraday until 1834, and at first he did not comprehend the true nature of the operation. He corrected his error in 1835, and the credit of the discovery has been generally accorded to him. At an early date, Henry produced current-induction by means of 'common' electricity, which Faraday had not at first been able to accomplish.

In one of his numerous variations of Faraday's experiment, in which he used flat coils or spirals, he tried the effect of interposing a conducting-plate between the primary and secondary coils. He found that the shock from the secondary coil was almost totally destroyed by the introduction of a plate of copper or other conducting-material between it and the primary.

This was an important conclusion, and led to important results. Shortly after its publication, he received from Faraday a copy of his fourteenth series of experimental researches, in which he makes a statement diametrically opposed to that of Henry in reference to this effect, being, in substance, that the interposition of a conducting-plate made not the slightest difference in the result. This naturally excited in Henry a lively interest in the question, and he made an extensive investigation in order to determine which view was erroneous.

Curiously enough, both were correct. Faraday used a galvanometer in his experiments: Henry observed the strength of shocks, or the physiological effect. There are undoubtedly induced currents in the interposed conductors; but they will be transient, and their integral effect on the number of lines of force passing through the secondary will be zero. The effect, then, will be that the time of the rise and fall of the induced current will be altered. The variation taking place within a small fraction of the period of the galvanometer needle, the throw of the needle will not be changed; but the effect of the shock will be greatly modified, and may become insensible. Henry did not leave this question until he thoroughly understood the cause of the discrepancy.

The most important result of his original experiment, however, was that it led him to the discovery of induced currents of the second, third, and fourth orders.

It is not possible to refer, in this place, to many other investigations of great interest which are to be found recorded in part i. A few of them relate to other departments of physical science, and some of them are not well known, even to his own countrymen. On the very first page will be found an account of a most admirable lecture experiment, which might well find a place in our modern courses, but which is probably not generally known to professors of physics.

Many lovers of pure science will find it hard, after a perusal of part i., to avoid a feeling of regret that Henry was not allowed to continue his researches, instead of being called to the directorship of the Smithsonian institution. That he was exceptionally well qualified for this important post, no one will deny, although it must have been accepted at a sacrifice which no one understood better than Henry himself. Throughout his long connection with the institution, and during a career which needs no praise and requires no comment, he con-

tinued his scientific work whenever opportunity was offered. But this work was largely of a character different from that of his earlier years. Many of his papers in the first part show that his nature was too large to permit of his assuming, as some men of science have assumed, and even boastfully, an absolute indifference as to the so-called practical applications of his investigations, and their worth as a means of bettering the condition of mankind. His work while director of the Smithsonian was very closely related to applied science. He was now called upon to consider and decide questions of great practical importance. Much of his time, which he would doubtless have gladly given to researches of a higher order, was occupied in devising methods of testing materials for public buildings, in considering the acoustics of public halls, in investigating the relative value of illuminants for the light-house board; and in the capacity of chairman of this board he planned and executed the extensive and important series of experiments and investigations on the use of fog-horns, steam-whistles, etc., and on the transmission of sound, which are printed at length in the latter part of the first volume. A large part of the second volume is devoted to an extended series of essays on meteorology. This was a subject in which Henry had always been interested. On the organization of the Smithsonian institute, he had named meteorology as one of the subjects the investigation of which could properly be assumed by the new establishment. As early as 1848 he suggested the use of the telegraph in the study of American storms, and explained the benefit which would accrue to commerce and agriculture from its use in the dissemination of weather-warnings. He organized a gigantic system of voluntary meteorological observers, by the aid of which much light was thrown upon the climatic conditions of the country. All of the meteorological work of the institute was finally turned over to the U. S. signal service upon its organization, and the success of this service was and is largely due to Henry's labors as a pioneer.

His essays on meteorology were in plain and unpretentious language; the medium of their publication was such as to secure their wide distribution and diffusion among the masses of the people; and the general interest in the subject today, as well as the general intelligence of the public in regard to it, must be largely attributed to their influence. These essays constituted the first easily accessible scientific treatment of the physics of atmospheric phenomena which appeared in this country, and they contain much matter of great value to the meteorologist of the present time.

The reader will thank the editors for including in this collection several essays and addresses to scientific societies concerning their organization and working-plans, which, although not strictly scientific, have had, and will continue to have, an important bearing upon the progress of science. In every respect the work of compilation seems to have been done with exactness and care; most readers, however, would have welcomed the addition of a good portrait and a brief biography.

The publication and circulation of these volumes will enable scientific men, both at home and abroad, to make a juster estimate of Henry's great services to science, and the study of his earlier researches must convince competent judges that he was one of the really strong physicists of the first half of the present century.

STORER'S AGRICULTURE.

UNDER the modest title of 'Agriculture in some of its relations with chemistry,' Professor Storer has given us what, in our judgment, is the most noteworthy contribution to agricultural literature of recent years, either in this or any other country. We say this advisedly, and after a careful examination of the book.

It may be said to treat broadly of manures and fertilizers, or better, perhaps, of 'plant-feeding,' since it includes, along with the main topic of manures and manurial substances and their application, much with regard to the plant itself; the soil and atmosphere, which are the media of its growth, and from which its food is derived; the culture and handling of different crops; and the adaptation of crops and systems of farming to local conditions.

The subject is a difficult one to treat satisfactorily, on account of its complexity and also because of the very imperfect state of our knowledge upon it in many directions, and accordingly there has been a dearth of good books upon it. As regards the English language, the dearth may be said to have been absolute. There has been hitherto no book treating of these matters which could be recommended to a student who desired any thing remotely approaching a thorough and systematic acquaintance with the present state of our knowledge on this subject.

The students of other countries have been somewhat better off; but even there, so far as the writer's acquaintance with the literature of agriculture extends, there has been no one work which adequately covered the whole field of plant-feeding in its scientific and practical aspects. This

Agriculture in some of its relations with chemistry. By F. H. STORER. New York, Scribner. 8°.

we think Professor Storer's book does. While, in the words of the preface, 'it makes no special appeal to chemists or students of chemistry,' it is nevertheless a thoroughly scientific book in the truest sense of the term. While it is strikingly free from the technicalities of science, its statements and discussions are based on so thorough a knowledge of science in its relations to agriculture, and so pervaded by the scientific spirit, as to render the book most valuable to all students of agricultural science.

It is, however, in its felicitous union of science with practice that the book is pre-eminent. Many otherwise good agricultural books suffer from a certain impracticability, arising from a deficient acquaintance, on the part of their writers, with the conditions of practice; while of others exactly the converse is true. Neither of these faults, however, can be attributed to the present work. While its scientific merits commend it to the student of science, its practical common sense as well as the lucidity and suggestiveness of its discussions will commend it no less to the thinking farmer. Indeed, we anticipate that one of the most valuable features of the book will prove to be that it will, on the one hand, help to remove the prejudice against science which is still too prevalent among farmers, and, on the other hand, tend to inspire in the minds of students of science a greater respect for, and a more earnest study of, the practices and maxims of successful practical agriculture.

GEOLOGY OF MINNESOTA.

THE annual reports of state surveys are, for the most part, dull reading, especially for non-residents; since they are necessarily of a detailed and fragmentary character, showing the progress of investigation in many different directions, with very little completed work. Both the reports before us, however, embody material of more than local interest, and it is desired to call attention here to those portions, without attempting to notice the entire contents of the volumes.

The notes on the section from Duluth north to the iron-mines about Vermilion Lake give Professor Winchell's latest views concerning the stratigraphy of the crystalline rocks of north-eastern Minnesota, between Lake Superior and the international boundary. The height of land between Lakes Superior and Vermilion is marked by two distinct ranges, — the high and broad Mesabi Range, composed of eruptive gabbro and red metamorphic granite; and, north of this, the lower and narrower Giant's Range, consisting of gray and red syenites, which have been referred to the Laurentian, and mark an important anticlinal axis. North of this axis, and dipping north at high angles, is a broad belt of the green and red jaspery and magnesian schists and conglomerates referred to the Huronian. South of the axis, the Huronian series appears to be concealed by a fault; but we have above it, dipping to the south in conformable succession, the Animikie slates and quartzites, the gabbro and granite of the Mesabi Range, and the greenish trap of the cupriferous series, extending from the Mesabi Range to Lake Superior.

The gabbro, Animikie, and Huronian series are each characterized by important deposits of iron ore; and this district is, with almost phenomenal rapidity, assuming a position of the first importance as regards the products of its mines. The iron of the gabbro belt is, as usually with rocks of that class, titanic. It furnishes the iron-sand of the Lake Superior beach, and, so far as known, has no parallel in Michigan and Wisconsin. The iron ore of the Animikie slates is hard hematite and magnetite, and probably parallel to the Commonwealth mines of Wisconsin, but without any known equivalent in Michigan; while the Huronian deposits, occurring chiefly about the south end of Lake Vermilion, consist almost wholly of hematite, and seem to agree closely in character and position with the Marquette and Menominee deposits of Michigan and Wisconsin.

The Vermilion Lake mines are being rapidly exploited, and the discovery of these ore-bodies is regarded as marking an epoch in the economic history of Minnesota and the north-west.

The salt-wells of north-western Minnesota and the adjacent portions of Dakota and Manitoba are believed to give promise of important developments; and various facts are cited tending to show, that, although the occurrence of carboniferous strata in this region has not been heretofore definitely known, these brines, like those of Michigan, really have their source in that formation.

Minnesota, it is well known, is, for the most part, deeply drift-covered, and the solid rocks are rarely exposed, except along the principal streams. For this reason, great geological interest attaches to the numerous deep wells which are being drilled in different parts of the state. They not only show what would be the surface rock if the drift were removed, but also establish the order, thickness, and continuity of the different horizons down to the crystalline foundations of the state, at points far removed from their outcrops.

In the deep wells of central and south-eastern

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Minnesota, there has been found, beneath the St. Croix sandstone, which has for a long time been regarded as the equivalent of the Potsdam sandstone of New York, some four hundred feet of red and green shales, associated with some red sandstone, and succeeded below by a hard red quartzite. This has been uniformly supposed to be the red quartzite that outcrops in south-western Minnesota and the adjacent parts of Iowa and Dakota, and, in Pipestone county, contains the celebrated red clay, otherwise known as pipestone and Catlinite.

The isolation of the outcrops and the supposed absence of fossils have heretofore left the age of this interesting formation in doubt; but it has usually, in recent years, been referred to the Potsdam, although that reference has appeared very unsatisfactory, in view of the records of the deep borings already noticed. Geologists must therefore regard with great satisfaction the discovery in the Catlinite of characteristic fossils, which is here announced. Two forms have been described and figured under the names Lingula Calumet and Paradoxides Barberi, which are believed to indicate the lowest primordial zone, i.e., the Acadian, which embraces the Paradoxides beds of St. John, N.B., and Braintree, Mass.

The discovery of Acadian fossils in the pipestone establishes an important datum for determining the true horizons of other rocks of the north-west. Thus Professor Winchell has referred the overlying red shales, observed in the artesian wells, with much probability to the Georgia slates of Vermont; and the red sandstones connected with them, which appear to expand toward Lake Superior so as to become the red sandstones called Potsdam by the Wisconsin geologists, really become, in that case, the equivalent of the true Potsdam of New York. This makes it necessary to refer the St. Croix sandstones and associated magnesian limestones to the *calciferous* of New York, with which they are more closely allied paleontologically.

Passing to the other extreme of the geological scale, we find two contributions, by Dr. G. M. Dawson and Messrs. A. Woodward and B. W. Thomas, to the paleontology of the bowlder-clay, or drift. The microscopic examination of the bowlder-clays of Minnesota and adjacent regions shows that various species of Foraminifera and other microscopic forms are very generally present, with fragments of larger organisms.

The more important of the Foraminifera are described and figured. Concerning the real origin and age of these fossils, Dr. Dawson says, "that, of all the organic bodies met with, none can be assigned with certainty to the glacial period or era of deposition of the bowlder-clay itself. The origin of most can be traced unequivocally to the older rocks, from which they have been derived, and incorporated with the bowlder-clays." In Illinois the Foraminifera seem to have been derived chiefly from Devonian shales, but farther west they are characteristic cretaceous forms. Dr. Dawson further points out that while the examination of these drift-fossils will serve to throw additional light on the direction of glacial movement, — a point of particular value over the wide area of the plains, where the soft character of the rock precludes the test of direction of striation, — they have so far failed to afford any certain information as to the actual condition prevailing during that period. But the negative evidence, re-enforced by the fact that the derived fossils have been so perfectly preserved, leads to a belief in the great scarcity of life during the ice age.

The principal feature of the report for 1885 is the bibliography of recent and fossil Foraminifera, prepared by Mr. A. Woodward as an introduction to a contemplated work on the Foraminifera and other microscopic organisms of the cretaceous of Minnesota. The completeness of this work may be judged by the fact that one hundred and thirty-three titles are given for eozoon alone.

BORNEMANN, in the *Deutsche medicinal-zeitung*, states that the victim of morphine looks to cocaine for help, and, mistaking its effects for those of morphine abstinence, seeks to remove them by more cocaine, until, unless he becomes enlightened, he finally becomes an inmate of an insane-asylum. In three out of six cases known to him, this was the result. He evidently agrees with those members of the medical profession who are endeavoring to restrict its use, by saying, "More urgently than ever in the case of any other drug, are legal regulations and limitations needed for the sale of cocaine, which now, unfortunately, is too easily accessible to every layman."

— There has been of late considerable discussion among physicians in the west as to the nature of mountain-fever, — a fever which occurs in the Rocky Mountain region, and which has by some been supposed to be peculiar to that locality. Dr. Curtin, who has recently been engaged in an investigation of the subject, finds that almost any disease which occurs in the mountains is liable to be called mountain-fever. He regards that disease which is more commonly known by this name as true typhoid, modified by the peculiar conditions of elevation, etc.